

C L A I M S

1. An insulating film-forming apparatus,  
comprising:

5           a substrate process section for applying a  
prescribed processing to a substrate for forming an  
insulating film on the substrate;

a substrate transfer section for transferring the  
substrate from the outside into the substrate process  
section; and

10          a substrate transfer mechanism for transferring  
the substrate between the substrate process section and  
the substrate transfer section;

wherein:

15          the substrate process section includes a process  
tower housed in a housing and consisting of a plurality  
of process units, which are stacked one upon the other,  
for performing a series of processing for forming an  
insulating film on the substrate, said process tower  
including a coating unit for coating the substrate with  
20          a chemical liquid containing a material of the  
insulating film so as to form a coating film, and a  
heating unit for heating the substrate having the  
coating film formed thereon; and

25          the process tower is detachable from the substrate  
process section.

2. The insulating film-forming apparatus  
according to claim 1, wherein the process tower

comprises a frame of a prescribed shape, the plural process units are individually detachable from the housing of the process tower.

3. The insulating film-forming apparatus  
5 according to claim 1, wherein:

each of the plural process units is equipped with a unit control device for controlling the processing of the substrate within the process unit;

10 the process tower is equipped a tower control apparatus that can be connected to the unit control devices so as to control a series of processing applied to the substrate by the plural process units arranged within the process tower; and

15 the tower control apparatus automatically recognizes the process unit when the unit control device is connected to the tower control apparatus.

4. The insulating film-forming apparatus  
according to claim 3, further comprising a film thickness measuring section for measuring the thickness  
20 of the insulating film, wherein:

the tower control apparatus is constructed to control the process parameter of each of the plural process units arranged within the process tower; and

25 the tower control apparatus controls the process parameter of the coating unit based on the thickness, which is measured by the film thickness measuring section, of the coating film formed in the coating unit.

5. The insulating film-forming apparatus according to claim 3, further comprising a film thickness measuring section for measuring the thickness of the insulating film, wherein:

5           the tower control apparatus is constructed to control the process parameter of each of the plural process units arranged within the process tower; and

10           the tower control apparatus controls the process parameter of the heating unit based on the thickness, which is measured by the film thickness measuring section, of the insulating film processed in the heating unit.

6. The insulating film-forming apparatus according to claim 1, wherein:

15           the substrate transfer section includes a table on which is disposed a carrier housing a plurality of substrates;

              the substrate process section includes a transfer unit on which the substrate is temporarily disposed;

20           and

              the substrate transfer mechanism includes:

              a first transfer device arranged in the substrate transfer section for transferring the substrate between the table and the transfer unit; and

25           a second transfer device arranged in the substrate process section for transferring the substrate between the transfer unit and the plural

process units.

7. The insulating film-forming apparatus according to claim 1, wherein the process tower includes a temperature control unit for controlling the substrate before coating with the chemical liquid at a prescribed temperature.

8. The insulating film-forming apparatus according to claim 1, wherein the substrate process section includes a plurality of process towers.

10 9. The insulating film-forming apparatus according to claim 8, wherein each of the plural process towers includes a plurality of process units for forming an insulating film, the plural process towers form the same kind of the insulating film.

15 10. The insulating film-forming apparatus according to claim 8, wherein at least one of the plural process towers includes a plurality of process units for forming an insulating film differing in kind from the insulating film formed in another process tower.

20 11. The insulating film-forming apparatus according to claim 8, wherein a first insulating film is formed on the substrate in one of the plural process towers, and a second insulating film is formed on the first insulating film in another process tower.

25 12. The insulating film-forming apparatus according to claim 1, comprising a plurality of

substrate process sections, wherein at least one substrate process section is detachable from the other substrate process sections.

13. The insulating film-forming apparatus  
5 according to claim 1, wherein the substrate process section further includes a curing unit for applying a curing processing to the insulating film after the heat processing applied by the heat processing unit.

14. The insulating film-forming apparatus  
10 according to claim 13, wherein the curing unit includes an electron beam irradiating mechanism for curing the insulating film by the electron beam irradiating processing.

15. The insulating film-forming apparatus  
according to claim 13, wherein the curing unit is arranged to constitute the uppermost section of the process tower.

16. The insulating film-forming apparatus  
according to claim 13, comprising a plurality of curing units that are stacked one upon the other so as to form  
20 a tower.

17. The insulating film-forming apparatus  
according to claim 6, further comprising a curing unit arranged in a position adjacent to the substrate process section so as to permit the substrate to be transferred into and out of the curing unit by the second substrate transfer device, said curing unit  
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serving to apply a curing processing to the insulating film after the heat processing applied by the heating unit.

18. The insulating film-forming apparatus  
5 according to claim 17, comprising a plurality of curing units, which are arranged in a position adjacent to the substrate process section and stacked one upon the other so as to form a tower.

19. The insulating film-forming apparatus  
10 according to claim 18, wherein the curing unit includes an electron beam irradiating mechanism for curing the insulating film by the electron beam irradiating processing.

20. The insulating film-forming apparatus  
15 according to claim 1, wherein the coating unit comprises:

a coating process section having a substrate holding mechanism for holding the substrate substantially horizontal, a chemical liquid supply nozzle for supplying a chemical liquid onto the substrate held by the substrate holding mechanism, and a cup surrounding the side surface of the substrate held by the substrate holding mechanism and equipped with a exhaust port of the chemical liquid formed at 25 the bottom; and

a waste liquid recovery section arranged below the coating process section and having a waste liquid tank

for storing the waste liquid exhausted from the exhaust port and with a waste liquid passageway for introducing the waste liquid exhausted from the exhaust port into the waste liquid tank.

5        21. The insulating film-forming apparatus according to claim 20, wherein:

the waste liquid recovery section further comprises a chemical liquid tank storing the chemical liquid used in the coating process section; and

10        the coating process section further comprises a pump for supplying the chemical liquid from the chemical liquid tank into the chemical liquid supply nozzle.

15        22. The insulating film-forming apparatus according to claim 20, wherein the waste liquid recovery section further comprises a chemical liquid tank storing the chemical liquid used in the coating process section, and a pump arranged sideward of the chemical liquid tank for supplying the chemical liquid 20 from the chemical liquid tank into the chemical liquid supply nozzle.

25        23. The insulating film-forming apparatus according to claim 20, wherein the waste liquid recovery section further comprises a chemical liquid tank storing the chemical liquid used in the coating process section, and a pump arranged on the upper side of the chemical liquid tank for supplying the chemical

liquid from the chemical liquid tank into the chemical liquid supply nozzle.

24. The insulating film-forming apparatus according to claim 1, wherein:

5 each of the plural process units is housed in a casing, and the process tower includes a housing which accommodates the plural casings accommodating the process units; and

10 at least the casing accommodating the heating unit and the casing accommodating the coating unit are arranged within the housing such that an air passageway is formed therebetween so as to achieve the heat insulation.

15 25. The insulating film-forming apparatus according to claim 24, further comprising an air blowing mechanism for blowing the air having the controlled temperature and humidity into the coating unit so as to control the temperature and humidity of the coating unit, wherein the casing accommodating the 20 coating unit is constructed to permit the air blown from the air blowing mechanism into the coating unit to be exhausted from the coating unit into the air passageway.